

## FIELD STUDIES OF CATOCALA BEHAVIOR

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ALTHOUGH THE CATOCALA have always been popular with collectors, little information concerning their behavior and ecology is available. Some observations on the natural resting habits of adults have been recorded (e.g. Bunker, 1874; French, 1880; Johnson, 1882; Rowley & Berry, 1909; Kettlewell, 1958; and Sargent & Keiper, 1969), but most of these are anecdotal and not of a quantitative nature. The final paper is of particular interest since it includes not only field observations of resting *Catocala*, but also some experimental data which suggests that at least one species of *Catocala* (*Catocala antinympa*), along with several non-*Catocala* species, are capable of selecting backgrounds which match the reflectance of their forewings. Before field data can be used to substantiate these experimental findings, it seems necessary to conduct field observations on a truly quantitative basis. Thus, to determine that moths actually do select the appropriate background in nature, it must be shown that they are not randomly selecting backgrounds, but instead are actively choosing the appropriate ones from among a large number of possible choices. This study presents some preliminary work along these lines.

### METHOD

An area of mixed forest was selected in Hampshire County, in central Massachusetts, and the tree composition of the area was determined. The actual number of each tree species, and its percentage of the total forest composition, is presented in Table I.

Each day from July 15 to September 10, 1967, and from July 19 to August 5, 1968, the tree trunks of each of the trees on the experimental plot were searched systematically for resting moths, from ground level to a height of about 20 feet. When a moth was found, it was photographed and extensive notes were taken concerning the moth and its resting place. These notes included information as to the species of tree selected, the resting

Table I. The tree species found on the study plot-their actual and relative abundance.

Tree Species	Actual Number on Plot	Percentage of the total number of trees on the plot
Black Birch <u>Betula lenta</u>	48	33.80
Red Oak <u>Quercus rubra</u>	23	16.20
Red Maple <u>Acer rubrum</u>	21	14.79
White Birch <u>Betula papyrifera</u>	13	9.15
White Oak <u>Quercus alba</u>	10	7.04
White Pine <u>Pinus strobus</u>	9	6.33
Hickories <u>Carya spp.</u>	9	6.33
Sugar Maple <u>Acer saccharum</u>	7	4.93
Hemlock <u>Tsuga canadensis</u>	2	1.41
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Total Number of Trees on study plot	142	



Fig. 1. *Catocala ridua* "head-down" on black birch.



Fig. 2. *Catocala concumbens* "head-down" on white birch.



height of the moth, and the resting attitude ("Head-up" or "Head-down"). The moth was then captured in a glass jar, positive identification was made, and the moth was then released back into the study area.

## RESULTS

A total of 70 moths of 14 species were found for which positive identification could be made and complete information gathered. The total number of moths captured on each tree species, and the percentage of this number to the total number of moths captured, is shown in Table II. This data suggests that there may be some selection occurring, for more moths than expected are found on White Birch (*Betula papyrifera*), and possibly Red Oak (*Quercus rubra*), while fewer moths than expected are found on a number of tree species. This suggestion thus requires closer examination of the distribution of each moth species, and these results are included in Table III. Statistical analysis, by Chi Square tests, show that only in the case of *Catocala relictata* is there a significant difference between the expected number of moths on a tree (White Birch) and the observed number of moths. These results are particularly interesting in that *Catocala relictata* is the only species of the 14 studied that is primarily white in color, and thus the only one that would match the color of the bark of White Birch. The other species, having darker forewings, would best match other tree barks, and thus seem not to select particular backgrounds, but only choose any relatively dark barked tree. There may, however, be specific preferences or avoidances among species, but the number of individuals within any one species is so far too small for any consistent trend to be determined.

## RESTING ATTITUDE AND RESTING HEIGHT

Two other aspects of behavior have also emerged from this study. First, certain species are consistent in their resting attitude. Of the 14 species studied, only 3 species show a "Head-up" resting attitude while the remainder rest "Head-down". Those species which rest "Head-up" are: *Catocala relictata*, *C. neogama*, and *C. unijuga*. Within any given species, this attitude is consistent; in fact there were no exceptions among any of the species. Thus all 7 of the *C. relictata* studied sat "Head-up", while

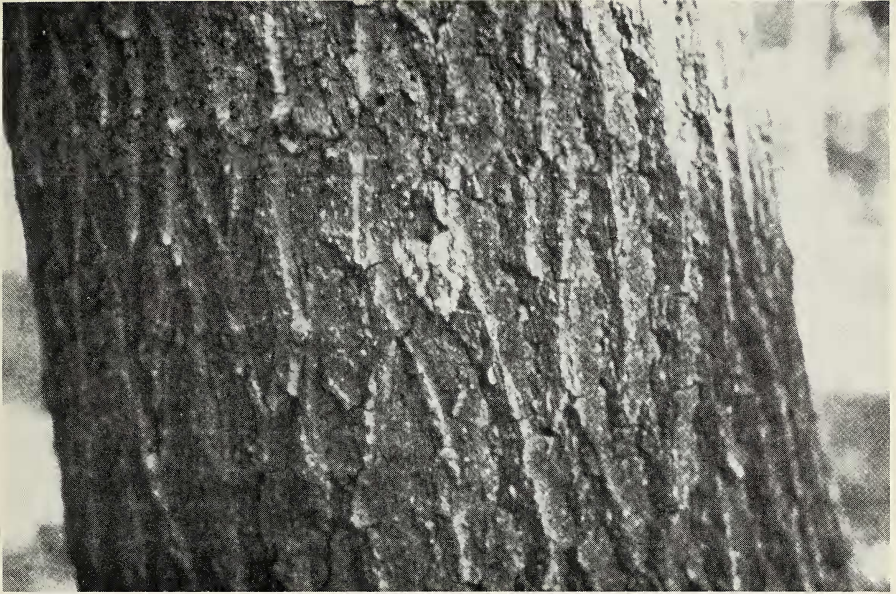


Fig. 3. *Catocala ridua* "head-down" on red maple.



Fig. 4. *Catocala relictata* found at rest — "head-up" on white birch.

Table II. The distribution of the observed moths on the trees  
of the study plot.

Tree Species	Number of Moths Captured	Percentage of Total number of Moths Captured
Black Birch (BB)	21	30.00
Red Oak (RO)	13	18.57
Red Maple (RM)	9	12.86
White Birch (WB)	16	22.86
White Oak (WO)	3	4.28
White Pine (WP)	3	4.28
Hickories (H)	2	2.86
Sugar Maple (SM)	3	4.28
Hemlock	0	0.00
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Total number of moths captured on study plot	70	

Significant deviation from chance selection. . . Analysis by  
Chi Square tests, Probability less than 0.01.



all of the individuals of *C. amica* (15), *C. vidua* (13), and *C. gracilis* (12) sat "Head-down". The importance of this resting attitude is now being experimentally studied with respect to possible functions associated with courtship or survival.

The second aspect of behavior noted was the consistency of certain species to select certain resting heights, regardless of the tree species rested upon. These results are shown in Table IV. Species such as *C. ilia* seemed to show a definite preference for resting high up on the trunk. This suggestion is further substantiated by data from released moths. These moths had been captured the previous night at "sugar", kept overnight in an experimental box (involved in other experiments), and released the next morning. Of 12 released *C. ilia*, 10 of the moths selected resting places over 10 feet up on the trunks. On the other hand, *C. vidua* seemed to prefer low resting places. Of the 13 individuals observed in this study, all rested below 9 feet, with 7 of the number resting under 2 feet in height. Once again, the importance of this behavior is not clearly understood, but is being further investigated experimentally.

#### SUMMARY

A study was made of 3 aspects of *Catocala* behavior by observing resting moths in a woodlot in central Massachusetts during the summers of 1967 and 1968. The first objective was to attempt to determine whether moths selected then rested upon backgrounds which tended to match their forewings. Although the number of individuals in all cases was small, it appeared that *Catocala relictata*, a moth with primarily white forewings spotted with black to varying degrees, did select White Birch for a resting place.

Secondly, the resting attitude was consistent within any one species, but varied interspecifically. Three of the 14 species studied rested "Head-up", while the remainder sat "Head-down".

Finally, there also seemed to be a preferred resting height for a number of species. Some, such as *Catocala ilia*, generally rested high up on the trunk, while others, such as *Catocala vidua*, rested very low on the trunks.

These results then reveal that a high degree of consistency exists in several aspects of *Catocala* behavior and suggest that further study should be conducted to determine why and how these unique behavioral responses occur.

Table III. The distribution of the most commonly observed species of *Catocala* on the trees of the study plot.

Catocala Species	Tree Species								Total Number of Moths
	<u>BB</u>	<u>RO</u>	<u>RM</u>	<u>WB</u>	<u>WO</u>	<u>WP</u>	<u>H</u>	<u>SM</u>	
<u>C. vidua</u>	2	3	3	4	0	1	0	0	13
<u>C. relictata</u>	0	0	0	6	0	0	1	0	7
<u>C. concumbens</u>	3	1	0	1	0	0	0	0	5
<u>C. gracilis</u>	5	0	1	4	0	1	0	1	12
<u>C. ultronia</u>	2	3	1	0	1	0	0	0	7
<u>C. amica</u>	6	5	1	0	1	1	1	0	15
	13	12	6	15	2	3	2	1	

For abbreviations of tree species, see previous table, Table II.

Significant deviation from chance, . . . Analysis by Chi Square test, Probability less than 0.01.

### LITERATURE CITED

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Table IV. Resting Height of Eight Species of Catocala.

Data Refers only to Observed Resting Moths.

Catocala Species	Resting Height		
	Low(0-3')	Medium (3-9')	High(Above 9')
<u>C. vidua</u>	8	5	0
<u>C. ilia</u>	0	0	3
<u>C. relictata</u>	2	3	2
<u>C. unijuga</u>	0	2	0
<u>C. concumbens</u>	1	3	1
<u>C. gracilis</u>	3	6	2
<u>C. ultronia</u>	0	3	4
<u>C. amica</u>	3	9	3

Denotes those species which rest "Head-up" on the trunk.

(C. neogama also rest "Head-up", but is not included in the table since only 1 specimen was captured)

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